

Table 1. Experimental parameters used to measure the electrochemical impedance response of a three-electrode MEA fuel cell

Applied $E$ vs. Interposed Pt Membrane (V)	AC Perturbation Amplitude (mV)	Resistive Load ( $\Omega$ )	Thermodynamic Effect
Open Circuit <0.448>	10	5	Cathodic polarization, pseudo-equilibrium condition of cell under load
0.708	10	5	Anodic polarization counteractive to oxygen reduction at cathode
1.000	10	5	Anodic polarization, very counteractive to oxygen reduction at cathode
-0.628	10	5	Cathodic polarization, conducive to oxygen reduction at cathode
0.628	10	5	Anodic polarization, slightly counteractive to oxygen reduction at cathode

Table 2 Results of model parameter fits as a function of the applied polarization potential (thermodynamic state) at the cathode.

Applied E vs. Interposed Pt Membrane (V)	Measured Current ( $\mu$ A)	Pore Electrolyte Resistance, $Z_{\text{pore}}$ ( $\Omega$ )	Charge Transfer Resistance, $R_{\text{ct}}$ ( $\Omega$ )	Cell Resistance ( $\Omega$ )	Cell Capacitance (mF)	Distribution Exponent, $\beta$
OCP <0.448>	-102	11.9 $\pm 17.4\%$	88.1 $\pm 12.3\%$	33.6 $\pm 0.85\%$	1.78 $\pm 5.21\%$	0.934 $\pm 0.31\%$
0.708	213	1.96 $\pm 19.1\%$	110 $\pm 13.3\%$	10.5 $\pm 0.54\%$	0.233 $\pm 3.48\%$	0.784 $\pm 0.22\%$
1.000	860	$\rightarrow 0^{\dagger}$	1094 $\pm 4.36\%$	25.4 $\pm 13.2\%$	0.00117 $\pm 7.37\%$	0.684 $\pm 0.26\%$
-0.628	-50,026	1.66	0.827	7.93	7.65	0.622
0.628	-1.14	8.70 $\pm 14.8\%$	61.9 $\pm 13.2\%$	10.2 $\pm 15.8\%$	1.29 $\pm 5.83\%$	0.937 $\pm 0.43\%$

† Dominated by charge transfer resistance ( $R_{\text{ct}}$ )